

A MONOGRAPH OF THE AUSTRALIAN LORICATES.

(Phylum MOLLUSCA—Order LORICATA.)

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VI.

Family PLAXIPHORIDAE.

Shells with eight-slit anterior valve, teeth not pectinated, one-slit median valves, and callused posterior valve; the girdle having corneous processes and sutural tufts, rarely with minute scales.

The shells are mostly of large size, the typical species reaching 150 mm. in length, but the subtropical and tropical forms are very small, not exceeding 15 mm. in length. As the group is represented by large species in the extremity of South America, Falkland Islands, New Zealand, and southern Australia—practically a circumpolar Antaretic distribution—so the small forms which occur in Madagascar, southern India, Ceylon, tropical eastern Australia, and New Caledonia show an almost world-encircling distribution with, so far as is at present known, a break in the American region. We anticipate that this hiatus will in time be filled by the discovery of one of the small forms on the Peruvian or Brazilian littoral.

The large forms seem very closely allied, the New Zealand and South American forms of the type being regarded as conspecific. The small forms appear closely related, though geographically so widely separated.

Only two genera are found in Australian Waters:—

Shells large; girdle with corneous processes only *Poneroplax*.

Shells small; girdle clothed with minute scales and having
corneous processes *Aerilamma*.

Genus PONEROPLEX.

Poneroplax Iredale, Proc. Malac. Soc., xi., 1914, 32. Type by original designation *Chiton costatus* Blainville.

Shells of large size, oval and with microscopically wrinkled sculpture and sometimes prominently sculptured in the same manner: anterior valve with eight radial ribs more or less obsolete: an ill-defined or semipustulose rib indicating the lateral area: posterior valve with mucro subterminal: insertion plates and sutural laminae large: anterior valve with eight slits, no pectination: sinus not toothed: no insertion plate in posterior valve, a heavy callus forming instead: girdle leathery, broad, with long corneous processes, rarely bunched at sutures, forming sutural tufts, which are more marked in juvenile than in adult examples, and disappear or become merged in the marginal processes in dried examples.

The following is a key to the species:—

Heavily sculptured:

Sculpture evanescent *albida*.

Sculpture persistent, and wavy on pleural areas *paeteliana*.

Rarely sculptured; smooth as juvenile *costata*.

PONEROPLAX COSTATA.

(Plate xviii., figs. 1, 9, 10.)

Chiton costatus Blainville, Diet. Sci. Nat. (Levrault), xxxvi., 1825, 548. King George Sound, Western Australia. Type in Paris Mus. Thiele, Revision Chitonen (Chun's Zoologica, Heft 56), Pt. 1, 1909, 24, pl. iii., f. 20, 21 (fig. of type).

Chiton glaucus Quoy & Gaimard, Voy. de l'Astrol., Zool., iii., 1835, 376, pl. 74, f. 7-11. D'Entrecasteaux Channel, Tasmania. Type in Paris Mus. (? lost). Not *Chiton glaucus* Gray, Spicilegia Zoologica, 1828, 5.

Euplaxiphora modesta Haddon, Zool. Challenger, xv., 1886, Polypl., 33, ex Carpenter M.S. Describes Brit. Mus. No. 67 from Australia. Type in Brit. Mus.

Plaxiphora tasmanica Thiele, Revision Chitonen (Chun's Zoologica, Heft 56), Pt. 1, 1909, 25, pl. iii., f. 24-26. Type in Berlin Mus.

Plaxiphora bednalli Thiele, Id. ib., 1909, 25, pl. iii., f. 27-31. South Australia. Type in Berlin Mus.

Plaxiphora albida May, Illus. Index Tas. Shells, 1923, pl. xv., f. 10.



Fig. 1.

P. costata Blainville. Valves 5 and 8. (After Thiele).

Plaxiphora tasmanica May, Id. ib., 1923, Appendix, pl. xv., f. 10.

Shell large, ovate, depressed, entire sculpture microscopic wrinkling, girdle with long slender nearly straight corneous processes, sutural tufts absent.

Colour brown, flamed with green or yellow, sometimes one or two valves wholly of the latter colours.

Anterior valve with eight indistinct radial waves.

Median valves broad, beaked, a smooth raised rib separating the lateral from the pleural areas.

Posterior valve with mucro almost terminal, no postmucronal area distinguishable, ante-mucronal area as pleural area of median valves.

Girdle leathery, fleshy when alive.

Interior blue, darker medially. Slitting 8—1—0.

Dimensions: 25 x 17 mm. (juvenile figured). Maximum measured: 98 x 44 mm.

Station: On the surface of rocks between tide marks.

Habitat: Western Australia, South Australia. Tasmania, Victoria.

Remarks: A juvenile shell from the type locality is described and figured.

PONEROPLAX ALBIDA.

(Plate xviii., figs. 2, 8, 11.)

Chiton albidus Blainville, Dict. Sci. Nat. (Levrault), xxxvi., 1825, 547. Ile King. Type in Paris Mus. Thiele, Revision Chitonen (Chun's Zoologica, Heft 56), Pt. 1, 1909, 24, pl. iii., f. 22, 23 (fig. of type).

? *Chiton petholatus* Sowerby (and var. *porphyrius*) Mag. Nat. Hist., iv. (Charlesworth), June, 1840, 289. New Holland. Types lost. Conch. Illus., f. 64, 65, and 59.

Chaetopleura conspersa H. Adams & Angas, P.Z.S., 1864, 193. Port Lincoln, South Australia. Type in British Mus.

Plaxiphora petholata var. *conspersa* Pilsbry, Man. Conch., Ser. 1., xiv., 1893, 324.

Plaxiphora costata May, Illus. Index Tas. Shells, 1923, pl. xv., f. 11.



Fig. 2.

P. albida Blainville. Valves 5 and 8. (After Thiele).



Fig. 3.

P. tasmanica Thiele. Valves 5 and 8. (After Thiele).



Fig. 4.

P. bednalli Thiele. Valves 5 and 8. (After Thiele).

Plaxiphora albida Ashby & Hull, Aust. Zool., iii., 1923, 83, pl. viii., f. 5 (6). King Island.

Shell large, ovate, subdepressed, sculpture well marked, girdle processes curved.

Colour dark to blackish brown, beaks frequently tipped with white; some valves flamed with green or yellow.

Anterior valve rayed with eight slightly elevated distant ridges, overridden by irregular wavy concentric cording.

Median valves broad, beaked, a prominent lateral rib, cut by wavy concentric lines so as to make it appear seminodulose, a similar ridge forming the posterior border of the lateral areas. Between these two ridges V-shaped wrinkles occur and these persist across the pleural area but vanish medially, the jugal area being faintly microscopically wrinkled.

Posterior valve with the mucro subterminal, postmucronal area almost smooth, ante-mucronal area wrinkle sculptured as pleural areas.

Girdle very broad, spongy, having corneous processes.

Interior bluish green, darker medially. Slitting 8—1—0.

Dimensions: 30 x 19 mm. juv. Maximum measured: 74 x 38 mm.

Station: On the surface of rocks between tide marks.

Habitat: Tasmania, Victoria, South Australia, Western Australia.

Remarks: An immature specimen from the type locality is described and figured.

The two species here allowed are generally separable at sight, the juveniles showing the distinctions clearly; the adults show variation, according to the station and locality, but are generally recognisable by means of the form of the posterior valve. Thiele's figures drawn from the type specimens are here reproduced. Attention has often been drawn to the variability of these species and up to the present no definite means of distinguishing subspecies is known. At King Island in Bass Strait, and at Port Arthur, South Tasmania, the two species grow side by side, *costata* living higher up and *albida* predominating lower down. At the latter locality the former shell rarely develops obsolete wrinkles with age, but becomes elongate and round backed, lengthening to an elongate oval of large size, the girdle becoming leathery and nude; a fairly large specimen when dried, measured 87 x 42 mm. From Fowler Bay, South Australia, small specimens agreeing with the topotype described have been examined, and from Neptune Island large specimens, 90 x 48 mm., agree with the large ones from Port Arthur, thus showing little variation from west to east. On the other hand *albida* from Port Arthur develops into a comparatively broader shell which never grows so large nor (owing to its station) does its girdle ever lose all its corneous processes; the prominent wrinkling being always present. An average large shell measures 63 x 42 mm. dried.

From Port Arthur also comes a narrow highly elevated shell strongly sculptured, which may be an ecologic variant or even a recognisable subspecies, in which case it might be called *maulei*.

At Port Lincoln, S.A., a small light coloured highly sculptured form occurs, upon which was based *Chaetopleura conspersa* H. and A. Adams. A feature of the *albida* form is the predominance of the light markings, while in *costata* the darker colour prevails.

PONEROPLAX PAETELIANA.

(Plate xviii. figs. 3, 7, 12.)

Plaxiphora paeteliana Thiele, Revision Chitonon (Chun's Zoologica, Heft 56).

Pt. I., 1909, 26, pl. iii., f. 34-36. "Tasmania and Cape York" error = Port Jackson, N.S.W. Type in Berlin Mus.

Plaxiphora costata Iredale, Proc. Mal. Soc., ix., 1910, 157. Caloundra, Queensland.

? *Plaxiphora excurvata* Pilshry, Man. Conch., Ser. I., xiv., 1893, 327, from Carpenter M.S. Australia? Haines Coll. and Coll. McGill University, Montreal.

Shell large, oval, depressed, round-backed, sculpture strongly wrinkled, girdle

broad, with long nearly straight corneous processes, with larger and thicker ones at sutures.

Colour generally brown flamed with green or yellow, but wholly greyish white examples are not uncommon, while occasional blotches of blue or red are found on some specimens.

Anterior valve concentrically closely wrinkled, the eight radials obsolete or appearing only as waves: the apex smoother.

Median valves with the lateral areas not very well differentiated but bounded by two radial ribs, the intervening space sculptured with wrinkled V sculpture, which appears to cut the radials into nodules, and then pass on to the pleural and turn towards the jugum. This sculpture runs parallel to the edge of the preceding valve, becoming very fine on the jugal area. The posterior rib is similarly carved into about a dozen elongate lozenges, but these are not separated.

Posterior valve with the mucro depressed, nearly terminal, the postmucronal area scarcely defined, the ante-mucronal area sculptured as pleural area.

Girdle very broad, sutural tufts present and distinct in juveniles, but obscure in adults.

Interior pale bluish-green. Slitting 8—1—0.

Dimensions: 33 x 21 mm. juv. 80 x 40 mm. Maximum of examples measured.

Station: On the surface of rocks between tide marks. Juveniles are frequently found in the interstices between tunicates below low water mark.

Habitat: New South Wales, South Queensland.

Remarks: A juvenile shell from Freshwater Bay, near Port Jackson Heads, described and figured. The peculiar sculpture is diagnostic.

Genus AERILAMMA.

Aerilamma Hull, Proc. Roy. Soc. Queensland, xxxvi., 1924, 113. Type by original designation *A. primordia*, id. ih.

Shells of small dimensions and tropical distribution, having Plaxiphorid structure, but primitive ornament; the girdle covered with minute scales and bearing sparse corneous processes, the margins spiculate.

To this genus Hull has allotted *Plaxiphora parva* Nierstrasz (Zool. Jahrb., 1906, 501) from Mozambique, and *P. indica* Thiele (Revision Chitonen, 1909, 23) from Ceylon.

AERILAMMA PRIMORDIA.

(Plate xviii., figs. 13-17.)

Aerilamma primordia Hull, Proc. Roy. Soc. Queensland, xxxvi., 1924, 113, pl. xxi., f. 4. Stone Island, Port Denison, Queensland. Type in Queensland Museum.

Shell very small for the family, broadly ovate, not elevated, but carinated; side slopes convex. Colour olive-green, unevenly flecked with reddish-brown and blotched with dark green.

The sculpture of the whole shell is uniformly granulose, the grains somewhat irregular in shape and size, but all high and pointed.

Anterior valve broad and high, apex not beaked, planate.

Median valves: lateral areas distinctly raised, not differentiated, no diagonal, jugum broad, V-shaped, with the pustules small and crowded.

Posterior valve small, rounded, the pustules smaller and tending to a more

regular pattern than on the other valves; mucro prominent, posterior, straight behind.

Girdle wide, spongy, covered with minute, elongate, rounded scales, and having a few corneous processes opposite the sutures; margin spiculose, the under side densely minutely scaly. In dried examples the girdle contracts to one-third of the width when alive.

Interior bluish-green, paler at the edges and the sutural laminae, anterior valve with eight slits, median valves 1-1 slit, posterior valve unslit; callus wide, smooth; eaves projecting; sinus broad.

Dimensions: 7 x 5 mm. (type), maximum of series measured 15 x 9 mm.

Station: The type and several co-types were found on the under side of stones embedded in coral sand and debris between median and low water mark. On Armit Island a colony was found inhabiting a typical Plaxiphorid station in crevices in the rock and amongst clusters of oysters on a rocky promontory, above median tide mark.

Habitat: North Queensland, from Port Curtis to Cooktown.

Remarks: This genus presents an interesting example of the northward migration and synchronous degeneration of Antarctic species, the closely allied genus *Poncroplax* reaching greatest dimensions and occurring in greatest quantity in the sub-Antarctic Islands, Tasmania, and southern Australia.

Family CHITONIDAE.

This family includes the most highly specialised forms, some of the groups being well endowed with ocelli. There appear to be two or three distinct groups represented in the series at present associated under this name. Thus the *Rhyssoplax* series, the *Sypharochiton* series, and the *Lucilina* series are separable at sight, although the variation in the individual genera comprised in the series is not small. Beginning with the *Rhyssoplax* series, it has been shown that the evolution of the species is expressed in the growth stages of any species, and that all the stages are still represented as distinct species, forming an easily recognised chain of development such as is rarely seen in other groups. Commencing with *Delicatoplax*—*Tegulaplax* being a peculiar offshoot—the regular links in the serial chain of development are seen through *Rhyssoplax coxi*, *R. jugosa*, *R. exoptanda*, and *R. tricastalis* into *Mucrosquama carnosus* and *M. verconis*. It is suggested that *Amaurochiton* may be a very specialised ancient ally of this series.

The *Sypharochiton* series shows variation in another way as, while in the former series the variation in sculpture is a marked feature and the scale differentiation is small; in this the sculpture seems to vary very little, though the girdle covering ranges from scales to long spines, and in some genera the posterior valve loses its insertion plate, a callused plate forming in two or three cases independently. It should be noted that no degeneration of the insertion plates has yet been observed in the *Rhyssoplax* series.

The third or *Lucilina* series combines a glossy shell and horny scaleless girdle, the posterior valve varying from a peculiarly well developed one with a large mucro and toothed insertion plate, to a small flattened one with planate terminal mucro and callused insertion plate. An extraordinary variation is seen in *Schizochiton*, which is the only one of the family showing reduction in the slitting of the anterior valve; in addition it shows the largest ocelli, and is characterised by the large fissure in the posterior valve.

Ecologically the whole family may be divided into two groups, (a) Emergent, and (b) Immergent. The first group, like the *Plaxiphoridae*, in their adult stages, take up stations on the surface of rocks above median tide mark, and are therefore exposed to the air for long periods twice daily; some examples in fact remain even above mean high water mark and are only submerged during spring tides or by the surf in rough weather. The emergent group comprises the whole of the *Sypharochiton* series, and *Onithochiton* of the *Lucilina* series. The entire *Rhyssoplax* series is immergent, none being found exposed at any state of the tide. *Lucilina* and *Schizochiton* are sometimes found just above mean low water mark, but always under stones or in crevices of dead coral, and not exposed to the air.

In relation to size of shell, the following dimensions are assigned to the three grades referred to, viz.:—"Small"—under 20 mm. in length; "medium"—20-35 mm., and "large"—over 35 mm., the measurements being of average adults.

Practically the only feature diagnostic of this family is the pectination of the insertion plates. In addition the slitting of the anterior valve is eight or more, the higher number being caused by interslitting. In only one case, *Schizochiton*, is it less, being six or seven.

As a guide to the determination of the groups, the following scheme is proposed.

Girdle scaly:

Teeth finely pectinate:

Scales very small:

Shell practically smooth *Delicatoplax*.

With concentric ridges only *Tegulaplax*.

Scales larger:

Shell with linear sculpture present on central areas . . *Rhyssoplax*.

Scales large and mucronate *Mucrosquama*.

Scales large and rounded:

Sculpture distinctive *Amaurochiton*.

Teeth coarsely pectinate:

Posterior valve strongly toothed: scales large *Sypharochiton*.

Posterior valve weakly toothed: scales small *Squamopleura*.

Girdle semispinose, spines clubshaped, posterior valve callused . . *Clavartzona*.

Girdle spinose: posterior valve callused *Liolophura*.

posterior valve with toothed insertion plate . . *Amphitomura*.

spines very long *Acanthopleura*.

Girdle leathery: posterior valve callused *Onithochiton*.

posterior valve with prominent toothed insertion plate. *Lucilina*.

Girdle spiculose: posterior valve strongly fissured *Schizochiton*.

Genus *DELICATOPLAX*, n. gen.

Type *Chiton translucens* Hedley & Hull.

This peculiar form is at present only known from the Peronian Region, and represents the ancestral stage of all the *Rhyssoplacid* forms. In addition the girdle scales are small for this family, but the insertion plates are pectinated, the sinns very narrow but coarsely pectinate, the sutural laminae consequently very large.

DELICATOPLAX TRANSLUCENS.

(Plate xviii., figs. 21-25. Plate xx., fig. 15.)

Chiton translucens Hedley & Hull, Rec. Aust. Mus., vii., 1909, 263, pl. lxxiv., f. 14-18. Vaucluse, Port Jackson, N.S.W. Type in Australian Museum.

Shell large, elevated, carinated, side slopes straight. Colour buff, clouded with olive and sage-green, and microscopically freckled with rufous, in some specimens shaded with orange-red on the lateral areas.

Entire surface finely granulated in quincunx. The general smoothness of the valves is only interrupted by a few impressed growth lines. The lateral areas of the median valves are raised, and there are a few rudimental furrows in the remoter pleural areas. The mucro of the posterior valve is median, sub-prominent.

Girdle broad, covered with small, finely striated, oval, polished, and densely subimbricate scales.

Interior flesh tint passing into green; sinus narrow, deep, denticulate. Slitting 8—1—10, teeth deeply irregularly pectinated on the edge and outside.

Dimensions: 38 x 21 mm. (type); 55 x 30 (maximum).

Station: Under stones below low water mark.

Habitat: New South Wales (Shellharbour, Port Jackson, Port Stephens), Southern Queensland (Caloundra, Point Cartwright).

Remarks: This shell, when alive, presents a beautiful translucent appearance, the prevailing tint being green. It is very clean, being apparently of a nomadic disposition, and therefore less exposed to the attacks of parasites. It prefers smooth surfaces, and is often found on sunken glass bottles. In describing the furrows in the pleural areas the authors used the term "vestigial." In the light of a more critical examination of the evolutionary process of the family, we adopt the view that these furrows are in fact rudimental.

Genus TEGULAPLAX, n. gen.

Type *Chiton howensis* Hedley & Hull.

This curious genus recalls *Rhyssoplax* but the animal is alert and active like that of *Ischnochiton* (*sensu lato*). The elongate shape with the narrow elevated shell and very broad girdle and characteristic sculpture present features easily recognised. It would appear to be an early offshoot from the ancestral *Rhyssoplacid* stock which developed a curious sculpture, and has retained it without modification for a long period. When Hedley and Hull described the type species they were unaware that any of the group had been previously known, whereas four species had been introduced in literature:—*Ischnochiton ravanac* Sykes (Rep. Ceylon Pearl Oyster Fisheries, Suppl. iv., 1903, p. 178, pl. 1, fig. 4, from Ceylon); *Ischnochiton hululensis* Smith (Fauna and Geog. Maldives and Laccadive Arch., Vol. II., 1903, p. 619, pl. xxxvi., figs. 3-6, from Hulule I.); *Chiton imbricatus* Nierstrasz (Siboga Exped. Monog., xlviii., 1905, p. 79, pl. ii., f. 37, pl. vii., figs. 188-194, from the Moluccas) and *Chiton (Clathropleura) platei* Thiele (Revision Chitonen., pl. ii., 1910, p. 92, pl. ix., f. 46-48, from the Red Sea).

The distribution suggested its discovery in Australian waters, and we now record it owing to the acumen of the dozen of Loricata collectors in Australia, Mr. E. H. Matthews, now in his seventy-sixth year, after whom we name the Australian species.

The whole of the species show a very similar form and sculpture so that it is difficult to determine their exact relationship with the few specimens of all, save *howensis*, yet available.

TEGULAPLAX MATTHEWSI, n. sp.

(Plate xviii., figs. 26, 27.)

Shell small, elongate oval, strongly elevated, carinated, side slopes curved and steep, sculpture characteristic, girdle very broad, scales small striate ovals.

Colour creamy white, the jugal area pinkish-brown with a few white splashes, the sides of the valves with longitudinal splashes of greenish, the anterior valve nearly uniform greenish brown, the posterior valve mostly creamy white with a few splashes and a wedge-shaped patch of brown from the mucro to the girdle, which is irregularly numerous handed with pinkish brown.

Anterior valve fairly large, microscopically punctate, obsolete growth lines across valve, a couple of the characteristic concentric wrinkled ridges developing towards edge.

Median valves with the lateral areas elevated, showing half a dozen wrinkled ridges parallel to the girdle, the central areas smooth. (In some lights these ridges appear to overlap like tiles, hence the generic name).

Posterior valve with the apex elevated, median, the postmucronal slope concave, almost entirely smooth, a few wrinkles only beginning to appear: ante-mucronal area smooth.

Girdle very broad, with extremely small elongate oval closely imbricating scales, regularly striate with about ten striae.

Interior pale greenish white. Slitting 10—1—10-12.

Dimensions: 11 x 6 mm. juv.

Station: Under stones in pools on coral reef.

Habitat: Darnley Island, Torres Strait. Collected by E. H. Matthews.

Remarks: Though only one small specimen has yet been received it differs from the very large series from Lord Howe Island in its fewer concentric wrinkles and the concave postmucronal area.

Genus RHYSSOPLAX.

Rhyssoplax Thiele, Das Gebiss der Schnecken (Troschel), ii., 1893, 368.

Type by monotypy *R. jancirensis* = *Chiton affinis* Issel.

Clathropleura Thiele, Das Gebiss der Schnecken (Troschel) ii., 1893, 367.

Not *Clathropleura* Tiberi., 1877, of which the type is *C. laevis*. Cf. Iredale, Proc. Mal. Soc., xi., 1914, 39.

Anthochiton Thiele, Das Gebiss der Schnecken (Troschel) ii., 1893, 377.

Type by monotypy *Chiton tulipa* Quoy & Gaimard.

This genus comprises a large series of species of superficial similarity, though of varying sculpture.

The shells are of large to small size, elongate ovals, highly elevated, carinated, with scaly girdles. The sculpture varies from almost smooth, longitudinal sculpture always being present on the central areas, to strongly sculptured shells. Anterior valve always eight-slit, insertion plate short, teeth finely regularly pectinated: sutural laminae large, sinus broad, finely toothed, median valve with one slit at each side, finely pectinate: posterior valve with short insertion plate cut into about ten to twelve teeth, all being finely pectinate. Girdle scaly, scales striate but with a strong tendency to smoothness, sometimes small ovals, at others more rounded and larger, always closely imbricating.

As regards the sculpture, the juveniles of all the species are entirely smooth, the linear sculpture developing first on the pleural areas and then the radials on the lateral areas and end valves. This has been discussed by us in more detail in the Proc. Mal. Soc., xi., 1914, 39-41, and this Journal III., 1923, 163, and detailed figures are given on Plate xix., figs. 28-35 and 37 (*R. venusta*).

The species can easily be separated by means of the development of sculpture, thus:—

Anterior valve, lateral areas of median valves and postmucronal area smooth unsculptured:

Scales small, oval *orukta* series.

Scales large, suboval *jugosa* series.

Anterior valve, etc., weakly ribbed, ribs non-nodulose:

central areas weakly sculptured *calliozona*.

Anterior valve, etc., strongly ribbed, ribs non-nodulose,

central areas strongly sculptured *vauculensis*.

Anterior valve, etc., ribbed, ribs non-nodulose,

interstices pitted *bednalli* series.

Anterior valve, etc., ribbed, ribs nodulose,

central areas strongly sculptured *tricastalis* series.

i. Series of *R. orukta*.

The *orukta* series consists of two distinct species only, the typical *orukta* having a series of pits in front of the lateral area, the other species, *coxi*, having the pleural areas sculptured with a few weak sulcations only.

RHYSSOPLAX ORUKTA.

(Plate xviii., fig. 31. Plate xx., fig. 2.)

Chiton oruktus Maughan, Trans. Roy. Soc. S. Aust., xxiv., 1900, 89, pl. i., 3 a-g.

McDonnell Bay, South Australia. Type in coll. Maughan.

Rhyssoplax oruktus May, Illus. Index Tas. Shells, 1923, pl. xvi., f. 10.

Shell medium, elongate oval, elevated, subearinated, sculpture of pits on pleural areas only, girdle scales small, weakly striate.

Colour variable. "Greyish green, mottled with olive. Anterior valve slightly lighter in colour than the rest. Dorsal areas tipped with reddish tinge." (Type). Upon a ground of buff or ivory white, most elaborate, varying colour patterns are arranged in olive-greens or shades of brown. The girdle is generally tessellated.

Anterior valve smooth.

Median valves with lateral areas elevated, smooth, growth lines sometimes notable: the pleural areas smooth save for a series of longitudinal pits in front of the lateral area, twelve in number.

Posterior valve with the mucro at anterior third, the postmucronal slope straight and steep, postmucronal area smooth, ante-mucronal area pitted as central area.

Girdle with small scales, faintly striate.

Interior greenish-white. Slitting 8—1—10.

Dimensions: 20 x 10 mm. (type); 26 x 13 mm. Tasmanian specimen figured.

Station: Under stones below low water mark.

Habitat: South Australia. Tasmania, Victoria.

Remarks: The South Tasmanian shells which Ernest Mawle found fairly numerous at Port Arthur are mostly dark coloured, more elevated and more elongate than typical shells, with more numerous pits.

RHYSSOPLAX COXI.

(Plate xviii., figs. 19, 32-34. Plate xx., fig. 3.)

Chiton coxi Pilsbry, Nautilus, vii., 1894, 119. Port Jackson, New South Wales,

Type in Philad. Acad.

Chiton (Clathropleura) bellulus Thiele, Rev. Chitonen (Chun's Zoologica, Heft 56) Pt. ii., "1910" = Dec., 1909, 93, pl. x., f. 5-8. New South Wales. Type in Berlin Mus.

Chiton coxi Hedley & Hull, Rec. Aust. Mus., vii., 1909, 261, 262, pl. lxxiii., f. 3-5.

Shell small, elongate oval, elevated, semicarinated, sculpture of weak sulcations on pleural areas only, girdle scales, small ovals.

Colour extremely variable. "Delicate bluish, mottled or blotched with olive brown, yellow and white." (Type). While the prevailing colour is brown mottled with lighter, some examples are emerald green with one or two valves in purple; grey with several valves in scarlet, white with end valves in grey; or pale brown with several valves in black.

Anterior valve smooth.

Median valves with lateral areas elevated, smooth; pleural areas sculptured with a few longitudinal sulcations only: these vary in number in the same locality so the variation may be sexual.

Posterior valve with mucro median, postmucronal slope concave.

Girdle with small weakly striate closely imbricating oval scales; in many cases tessellated in contrasting colours.

Interior bluish or creamy white. Slitting 8—1—10-12.

Dimensions: 13 x 7.5 mm. (type); 21 x 12 (maximum).

Station: Under stones below low water mark.

Habitat: New South Wales, South Australia.

Remarks: Mr. E. H. Matthews collected a couple of specimens on smooth limestone rock, three feet below low water at Giles Point, S.A.

ii. Series of *R. jugosa*.

Key to the species:—

Anterior valve, lateral areas of median valves, and postmucronal area smooth:

Pleural sculpture weak *torriana*.
strong:

Few ribs crossing the valve *diaphora*.

All ribs crossing the valve *jugosa*.

RHYSSOPLAX TORRIANA.

(Plate xviii., figs. 18, 28-30, 35, 36. Plate xx., fig. 1.)

Chiton torriana Hedley & Hull, Rec. Aust. Mus., vii., Feb. 28, 1910, p. added (no pagination). New name for *C. torri*, id. Type in Aust. Mus.

Chiton torri Hedley & Hull, Rec. Aust. Mus., vii., 1909, 262, pl. lxxiii., f. 6-11. Kangaroo Island, South Australia. Not *Chiton torri* Suter, Proc. Mal. Soc., vii., 1907, 295.

Chiton hullianus Iredale, Proc. Mal. Soc., ix., June 30, 1910, 103. New name for *C. torri* Hedley & Hull.

Rhyssoplax torrianus var. *klemi* Ashby, Trans. Roy. Soc. S. Aust., xliii., 1919, 72, pl. xi., f. 3. Corney Point, Yorke Peninsula, South Australia. Type in coll. Ashby.

Shell large, oval, elevated, carinated, sculpture of weak sulcations on pleural areas only, girdle scales large.

Colour pale olive green with dark green concentric lines on both end valves and lateral areas of median valves; jugal area and edges of sulci in central areas deep green.

Anterior valve smooth.

Median valves with lateral areas smooth, elevated; the pleural areas sculptured with weak longitudinal sulci, these varying in number from 9-10 to 3-4.

Posterior valve with mucro ante-median, postmucronal slope nearly straight.
Girdle with large rounded oval scales, faintly striated.

Interior greenish white. Slitting 8—1—12.

Dimensions: 15 x 9 mm. (type); 44 x 25 mm. (maximum measured).

Station: Under stones below low water mark.

Habitat: South Australia, South Western Australia.

Remarks: The western shells appeared to show fewer sulcations on the pleural areas, but this is proven to be individual only as Ashby named this variety from South Australia.

RHYSSOPLAX DIAPHORA.

(Plate xviii., fig. 39. Plate xix., fig. 1.)

Rhyssoplax diaphora Iredale & May, Proc. Malac. Soc., xii., 1916, 115, pl. v., f.

1. Norfolk Bay, Tasmania. Type in Tasmanian Museum. May, Illus. Index Tas. Shells, 1923, pl. xvi., f. 9.

Shell large, elongate oval, very elevated, carinate, sculpture of longitudinal ribs on pleural areas only, girdle scales large.

Colour pale olive green, end valves and lateral areas concentrically lined in dark green, a white triangle on the postmucronal slope; the ridges between the sulci of the central areas reddish-brown, the sulci blue; jugal area dark green.

Anterior valve smooth, very perpendicular; in senile shells a faint radial ribbing is suggested.

Median valves with the lateral areas well elevated, smooth, growth lines present in old shells when radials may be indistinctly seen: pleural areas with weak longitudinal ribs less than half of which extend across the valve. These vary in number from ten to sixteen, four to seven reaching across: jugal area wide, wedge-shaped.

Posterior valve with mucro postmedian, postmucronal slope slightly concave.

Girdle with large rounded oval scales, obsoletely striate.

Interior pale bluish green. Slitting 8—1—12.

Dimensions: 31 x 17 mm. (type); 46 x 24 mm. (maximum measured).

Station: Under stones below low water mark.

Habitat: Tasmania, Victoria (except on eastern coast), South Australia.

RHYSSOPLAX JUGOSA.

(Plate xviii., figs. 20, 37, 38. Plate xx., fig. 4.)

Chiton jugosus Gould, Proc. Bost. Soc. Nat. Hist., ii., 1846, 142. New South Wales. Type in Phil. Acad. U.S. Exped. Mol., 1852, 317. Atlas, pl. 28, f. 430.

Lophyrus jugosus Gould, Otia Conch., 1862, 3, 242.

Chiton concentricus Reeve, Conch. Icon., iv., 1847, Chiton, sp., 95, pl. xvi., f. 95, New Zealand (Earl), error = Port Jackson, New South Wales. Mus. Cuming in Brit. Mus. Not *C. concentricus* Koninek, 1843, Deser. Anim. foss., 322. Nor *C. concentricus* Sowerby, 1840.

Chiton jugosus Pilsbry, Man. Conch., xiv., 1893, 178, pl. 36, f. 91-95. Hedley & Hull, Rec. Aust. Mus., vii., 1909, 262, pl. lxiii., f. 12, 13.

Shell large, oval, elevated, carinate, sculpture of longitudinal ribs extending across the pleural areas, girdle scales large.

Colour: While in general terms this may be described as extremely variable, there is yet a consistent colour pattern from which few deviations are found. The anterior valve, the lateral areas of the median valves, and the greater part of the posterior valve are ornamented with coloured concentric lines, the post-mucronal area of the posterior valve having an inverted V in white or with

rayed coloured lines parallel with the sides of the triangle. The ribs separating the sulci of the central areas are reddish-brown, while the sulci themselves are blue. The most frequent colour of the concentric line pattern is green, pale to dark olive, while it may be found wholly or partly in pink, red, orange, blue or black. The adoption of red for the whole or part of valves ii. and iii. is a common practice; and many specimens may be found with some or all of valves ii. to vii. in white. In most of these partial albinos traces of the concentric lines may be seen in faint grey, while the colouring of the central areas is constant, though faint. The most brilliant colouring is found amongst examples inhabiting sandstone country; basalt produces colder colouring, black and white contrasts being often found, while in granite and shale country the dull greens predominate.

Anterior valve smooth.

Median valves with the lateral areas well raised, smooth, growth lines rarely notable: pleural areas carved with straight square-cut ribs crossing the valves, ten to fourteen on each side, jugal area narrow, linear.

Posterior valve with mucro ante-median, postmucronal slope slightly concave.

Girdle scales large, convex, obsoletely striated.

Interior pale bluish or greenish white. Slitting 8—1—12.

Dimensions: 35 x 20 mm. (type); 48 x 26 mm. (maximum measured—Two-fold Bay, N.S.W.).

Station: Under stones below low water mark.

Habitat: New South Wales, Eastern Victoria.

iii. RHYSSOPLAX CALLIOZONA.

(Plate xix., fig. 2. Plate xx., fig. 13.)

Chiton aereus var. *calliozona* Pilshry, Nautilus, viii., 1894, 55. Gulf St. Vincent, South Australia. Type in Philad. Acad.

Lophyrus tulipa Angas, P.Z.S., 1865, 186. Port Lincoln, S.A. (error for *L. sicula*).

Chiton siculoides Angas, P.Z.S., 1878, 868. Nom. nud. Port Lincoln, S.A.

Chiton calliozona Bednall, Proc. Malac. Soc., ii., 1897, 151, f. in text and pl. xii., f. 6.

Rhyssoplax calliozoma (sic) May, Illus. Index Tas. Shells, 1923, pl. xvi., f. 8.

Shell very large, elongate oval, less elevated than majority of this genus, carinate.

Colour olive-green, darker on the lateral areas, lighter on the jugum; dark green vertical lines crossing the central areas. Girdle scales in alternate patches of claret and green.

Anterior valve with twenty flattened broad radial ribs, non-nodulose with narrow interstices, ribs increasing by intercalation with age.

Median valves with the lateral areas similarly sculptured with three or four radials with shallow undulations between: pleural areas with 2-12 weak sulci laterally, the jugal area broad and painted with lines parallel to and simulating these sulci. This sculpture becomes distinctly weaker with age; the sulci vary considerably, about two or three on each side in juveniles to twelve in adults.

Posterior valve with mucro submedian, postmucronal slope concave, postmucronal area obsoletely rayed as anterior valve.

Girdle scales large, very convex, very faintly striate.

Interior pale bluish. Slitting 8—1—10.

Dimensions: 38 x 18 mm. (type); 55 x 33 mm.

Station: At edge of smooth stones, imbedded in clean sand two to three feet below low water (E.H.M.).

Habitat: South Australia, Northern Tasmania, Victoria.

iv. RHYSSOPLAX VAUCLUSENSIS.

(Plate xix., figs. 8-12, 39. Plate xx., figs. 7, 12.)

Chiton vauclusensis Hedley & Hull, Rec. Aust. Mus., vii., 1909, 261, pl. lxxiv., f. 19-23. Vaucluse, Port Jackson, N.S.W. Type in Aust. Mus.

Rhyssoplax vauclusensis Hull, Aust. Zool., iii., 1923, 162, pl. xxv., f. 9-12.

Shell large, elongate oval, elevated, carinate, sides slopes slightly curved and steep.

Colour olive-buff, flamed with sepia in the pleural areas, the jugal area with sepia dots; most ribs picked out with orange or chocolate; rarely cream or ivory white with a few sepia dots on the posterior margins of the valves.

Anterior valve rayed with 20-28 ribs, not distinctly nodulose, interstices narrow but not pitted, number of ribs increasing with age by intercalation.

Median valves with laterals similarly sculptured with three or four ribs, more according to age: the central areas longitudinally strongly ribbed throughout, the jugal area very narrow and linear, the ribs about sixteen on each side, the number varying with age, the interstices square-cut.

Posterior valve with mucro slightly antemedian, the postmucronal slope concave, the postmucronal area rayed as anterior valve, but sculpture less pronounced: antemucronal area as central areas.

Girdle scales large, convex obsoletely striate.

Interior pale bluish green. Slitting 8-1-12.

Dimensions: 33 x 20 mm. (type); 44.5 x 25 mm. (maximum measured).

Station: On under or upper side of stones in 4-5 feet below low water mark.

Habitat: New South Wales (Shellharbour, Port Jackson, Port Stephens), Southern Queensland (Caloundra, Point Cartwright).

Remarks: Of this handsome and strongly sculptured shell only three examples were known between 1909 and 1921. In the latter year several were taken at the type locality, Bottle and Glass Rocks, Vaucluse, Port Jackson, and subsequently a considerable number were collected at Shellharbour by McAndrew, and Thackway at Port Stephens. Iredale took one at Caloundra, Queensland, in 1909, and Hull took several at the same place and at Point Cartwright, further north, in 1921-3. The Queensland shells are rather coarser in sculpture, and several juveniles were taken, showing the entire absence of sculpture on the lateral areas.

iv. Series of *R. bednalli*.

Radial sculpture strong; colouration green:

Twelve ribs on pleural area *bednalli*.

Ten ribs on pleural area *surrecta*.

Radial sculpture weak; colouration red *exoptanda*.

RHYSSOPLAX BEDNALLI.

(Plate xix., figs. 7, 18-21. Plate xx., fig. 6.)

Chiton bednalli Pilsbry, Nautilus, ix., 1895, 90. Yorke's Peninsula, South Australia. Type in coll. Bednall, now Matthews. Bednall, Proc. Mal. Soc., ii., 1897, 153, pl. xii., f. 8, and f. in text.

Rhyssoplax bednalli Hull, Aust. Zool., ii., 1922, 84, pl. xxiv., B., f. 5-8.

Shell large, elongate oval, strongly elevated, carinate, side slopes straight.

Colour cream white, with a small flesh pink spot at each beak, and a sparse mottling of same on lateral areas, the central areas clouded with green, the girdle flesh tinted with green bars.

Anterior valve with about twenty radial flattened ribs, the interstices narrow and pitted: the apex smooth.

Median valves with lateral areas elevated, similarly sculptured, the radial ribs three or four in number, the posterior seminodulose, their interstices pitted: the central areas sculptured with narrow longitudinal ribs extending across the valve, about twelve on each side, the jugal area narrow, smooth, linear.

Posterior valve with muero submedian, the postmucronal slope very concave, the postmucronal area sculptured as anterior valve but sculpture weaker: ante-mucronal area as central areas.

Girdle with large convex rounded faintly striate scales.

Interior bluish white, darker medially. Slitting 8—1—10.

Dimensions: 25 x 11 mm. (type).

Station: On small smooth stones in 18 inches at low water (E.H.M.).

Habitat: South Australia, Victoria.

RHYSSOPLAX SURRECTA.

(Plate xix., figs. 23-26. Plate xx., fig. 5.)

Rhyssoplax surrecta Hull, Aust. Zool., ii., 1922, 84, pl. xxiv., B., f. 1-4. Port Willunga, South Australia. Type in South Australian Museum.

Shell large, elongate oval, very elevated, carinated.

Colour white, flecked with pale reddish-brown on the lateral areas and beaks of median valves: central areas washed with pale green, flecks of the same colour appearing on the jugal tract.

Anterior valve with about twenty-six radial ribs, the interstices pitted, valve rather perpendicular.

Median valves with lateral areas radially ribbed, ribs few and flattened, interstices pitted, the posterior edge toothed but the rib not distinctly noduled: the pleural areas on each side crossed by ten bold longitudinal ribs, the jugal area narrow, linear.

Posterior valve with muero submedian, postmucronal slope very concave, postmucronal area rayed as anterior valve but sculpture less pronounced: ante-mucronal area as central areas.

Girdle scales large, convex, apically striate.

Interior pale greenish white. Slitting 8—1—12.

Dimensions: 35 x 12 mm. (type).

Station: Probably deep water.

Habitat: South Australia.

Remarks: This species appears to be a deeper water representative of *R. bednalli*, growing to a larger size, with bolder sculpture throughout.

RHYSSOPLAX EXOPTANDA.

(Plate xix., fig. 3. Plate xx., fig. 14.)

Chiton exoptandus Bednall, Proc. Malac. Soc., ii., 1897, 152, f. in text and pl. xii., f. 7. Gulf St. Vincent, South Australia (dredged). Type in coll. Bednall, now Matthews.

Shell large, elongate oval, elevated, carinate, side slopes straight.

Colour distinctive, reddish or pale vermilion, with concentric lines in darker on end valves and lateral areas of median valves; sometimes with wedge-shaped markings in deep red on the jugum, or irregularly at sides, vertically waved across lateral and pleural areas.

Anterior valve with about twenty flattened non-nodulose ribs, the interstices narrow and regularly pitted.

Median valves with lateral areas well elevated, sculptured as anterior valve, radials numbering two to four, evanescent towards edge. Pleural areas crossed by about eight bold well separated longitudinal ribs, succeeded by half a dozen

decreasing in size and more closely spaced, thus forming a wedge-shaped smooth jugal area.

Posterior valve with the muero postmedian, postmucronal slope concave, postmucronal area rayed as anterior valve but radials narrower and more closely packed: ante-mucronal area as central areas.

Girdle scales large, convex, very faintly apically striate.

Interior pinkish white. Slitting 8—1—12.

Dimensions: 27.28 x 14.15 mm. (type); up to 60 mm. (E.H.M.).

Station: Upper surface of smooth stones in sandy pools, two-three feet below low water (E.H.M.). Dredged in shallow water.

Habitat: South Australia, Victoria.

v. Series of *R. tricostalis*.

Characterised by bold nodulose radial sculpture and well developed longitudinal ribbing, girdle scales oval, striate, medium to small, not mucronate.

Scales strongly striate: longitudinal sculpture bold *tricostalis*.

very faintly striate: longitudinal sculpture weak *geraldtonensis*.

strong *venusta*.

Very bold sculpture: longitudinal and radial *excellens*.

RHYSSOPLAX TRICOSTALIS.

(Plate xix., fig. 5. Plate xx., figs. 9, 10.)

Chiton (canaliculatus var. ?) *tricostalis* Pilsbry, Nautilus, viii., 1894, 54. Gulf St. Vincent, South Australia. Type in Philad. Acad.

Chiton limans Sykes, Proc. Mal. Soc., ii., 1896, 93, *vide* Ashby, Trans. Roy. Soc. Vict., 1920, 153.

Chiton tricostalis Bednall, Proc. Mal. Soc., ii., 1897, 151.

Chiton aureomaculatus Bednall & Matthews, Proc. Mal. Soc., vii., 1906, 91, pl. ix., f. 3 a-f. Marion Reef, Troubridge Shoal, South Australia. Type lost.

Rhyssoplax tricostalis Ashby, Proc. Roy. Soc. Vict., xxxiii., 1921, 154, pl. viii., f. 2. May, Illus. Index Tas. Shells, 1923, pl. xvi., f. 11.

Shell medium, elongate oval, very elevated, carinate, side slopes straight.

Colour very variable. Wholly red, brown, olive-green or purple; frequently with valves ii. and iii. white; girdle generally tessellated.

Anterior valve with strongly nodulose radial ribs, the ribs varying in number and the nodules in strength: the type was described as having 17-19 ribs.

Median valves with lateral areas similarly ribbed, ribs varying from two to five, and size of tubercles varying, central areas with narrow jugal smooth area, about fifteen longitudinal ribs on each side, all but one or two extending across the valve.

Posterior valve with muero submedian, postmucronal slope concave, postmucronal area sculptured as anterior valve but weaker: ante-mucronal area as central areas.

Girdle scales small, elongate ovals, closely imbricating, striate.

Interior bluish white. Slitting 8—1—12.

Dimensions: 17 x 9 mm. (type); 30 x 15 mm.

Station: Under stones below low water mark.

Habitat: South Australia, Victoria, Northern Tasmania.

Remarks: The variation seen in the sculpture of this species in the juvenile stages is obliterated in senile shells. Thus a shell measuring 18 mm. may show radials of few large broad nodules, very like those seen in *verconis*, eleven on the anterior valve, two on the lateral areas and about eleven on the postmucronal area, seven nodules to a radial: another shell collected at the same time and place,

and very little larger, only 21 mm. in length, will show eighteen radials with others intercalating on the anterior valve, the nodules holder, more rounded and ten in a row, the lateral similarly with three rows: in each case the pleural area shows about eleven distinct ridges on each side.

A larger shell will show twenty strongly nodulose ribs on the anterior valve, four and five on the lateral areas and fifteen on the postmucronal area: the longitudinal ribs on the pleura number 12-13 on each side, all reaching across and leaving a narrow smooth linear jugum.

RHYSSOPLAX GERALDTONENSIS.

(Plate xix., fig. 4.)

Rhyssoplax geraldtonensis Ashby, Traus. Roy. Soc. S. Aust., xlv., 1921, 47, pl. viii., f. 1. Geraldton, Western Australia. Type in coll. Ashby.

Shell medium, elongately oval, strongly elevated, carinated. Colour dull cream, specked throughout with golden brown, on valves iii., iv., and v. a longitudinal patch of bright red-brown is seen extending from the girdle half way across each side of the valve; small patches of brown occur on the posterior valve.

Anterior valve obscurely radially ribbed with nodules, about sixteen rays, nodules only discernible in a good light; the posterior edge of the valve semi-toothed; apical portion smooth, twice as extensive as in *R. tricostralis*.

Median valves with the lateral areas rayed with ribs which number three or four, scarcely nodulose, the posterior one more marked; the pleural areas are longitudinally ridged with about a dozen weak ridges only, eight of which cross the valves, leaving a large wedge-shaped smooth jugal area.

Posterior valve with mucro median, postmucronal slope straight; postmucronal area rayed with a dozen semi-nodulose ribs; ante-mucronal area as central area.

Girdle scales small, very faintly striate apically.

Interior white. Slitting normal.

Dimensions: 26 x 14 mm. 20 x 11 mm (type).

Station: Under stones below low water mark.

Habitat: Western Australia.

Remarks: The shell described and figured was collected by Hull at Rabbit Island, King George Sound, W.A., and was examined by Ashby, who identified it.

RHYSSOPLAX VENUSTA.

(Plate xix., figs. 28-35, 37.)

Rhyssoplax venusta Hull, Aust. Zool., iii., 1923, 165, pl. xxii., f. 1-4. 9-12. Emu

Rhyssoplax particolor Hull, Proc. Roy. Soc. Queensland, xxxvi., 1924, 114.

Park, Keppel Bay, Queensland. Type in Australian Museum.

Shell small, elevated, oval, carinate, side slopes curved, sculpture of nodulose radials, and longitudinal ribs on pleural areas.

Colour apple-green, except valves iv. and v., which are pompeian red; the girdle yellow, except opposite valves iv. and v., where it is brick-red and there are a few irregular splashes of brick-red appearing on the yellow portion. (Type). Other examples are wholly brown, olive-green, dull red, and combinations of these colours with one or more valves in black.

Anterior valve with the early portion smooth, then twelve radial ribs of rounded separated nodules appear, increasing with age.

Median valves with lateral areas bounded by two semi-nodulose ribs, about six nodules to a rib, the interval between depressed, smooth; pleural areas with nine straight ridges on each side, interstices narrow, jugal area narrow, linear.

Posterior valve with muero median, postmueroal slope nearly straight, postmueroal area rayed as anterior valve, ribbing weaker, ante-mueroal area as central areas.

Girdle broad, scales small, elongate ovals, striate.

Interior bluish white. Slitting 8—1—11.

Dimensions: $8\frac{1}{2} \times 5$ mm. (juv.); 12×7 mm.; 17×10 mm.

Station: Under stones below low water mark. Occasionally found on dead coral or on *Pinna*.

Habitat: North Queensland (Keppel Bay to Thursday Island).

Remarks: As remarked upon when described the type was immature, and the development shows a well sculptured shell with twenty-five nodulose radial ribs on the anterior valve; four nodulose ribs on the lateral areas, sixteen on the postmueroal area: the pleural area has sixteen ridges on each side. Such a shell measures 17.5×9.5 mm. from Armit I.

A variant from Thursday Island shows little bold sculpture, though reaching a length of 17×10 mm.

RHYSSOPLAX EXCELLENS, n.sp.

(Plate xix., figs. 22, 27, 40.)

Chiton pulcherrimus Brazier, Proc. Linn. Soc. N.S.W., ii., 1877, 75. Darnley Island, Torres Strait. Type in Macleay Mus., Sydney. Not *C. pulcherrimus* Sowerby, P.Z.S., 1841, 103, from Island of Bohol, Philippine Group, in Mus. Cuming.

Shell medium, elongately oval, elevated, carinate, sculpture very complex, girdle scales large ovals, deeply grooved.

Colour creamy brown, the girdle with darker banding.

Anterior valve with about twenty-five radiating strongly nodulose ridges, the posterior edges apparently toothed.

Median valves with lateral areas very elevated, with three bold nodulose ridges, the diagonal showing an additional weaker nodulose rib anteriorly, while along the posterior edge a toothed rib is developed: pleural areas strongly longitudinally ridged with fourteen ridges on each side, a very narrow smooth jugal band being left: transverse ridges link up these longitudinals which are sharply nodulose.

Posterior valve with muero median, postmueroal area concave, sculptured with twenty radiating nodulose ridges, ante-mueroal area sculptured as pleural areas.

Girdle wide with large oval scales bearing deep grooves, about six grooves to a scale.

Interior white. Slitting 8—1—12, all teeth regularly pectinated.

Dimensions: 22×13.5 mm.

Station: ?

Habitat: Darnley Island, Torres Straits (Brazier, "Chevert" Exped.).

Remarks: This is probably the most beautiful species of *Rhyssoplax*, certainly with most complicated sculpture. Pilsbry (Man. Conch., Vol. xiv., p. 130, 1893) only cognizant of the Philippine species from Carpenter's MS. notes included it in *Ischnochiton*, the teeth being only faintly pectinated and the girdle scales weakly striated. Iredale compared the Darnley Island shell with the type tablet and noted that, though the Philippine Islands' shells undoubtedly were of the *Rhyssoplacidae* series, the dorsal area was sculptured like honeycomb and the pleural sculpture differed a little in detail: the Queensland shell differed in the strong pectination of the insertion teeth and the deep grooving of the girdle scales.

Genus MUCROSQUAMA, n. gen.

Type *Chiton carnosus* Angas.

This group shows the most remarkable development of the groups allied to *Rhyssoplax*, providing a heavily sculptured shell with a girdle covering of striated scales lengthening into semi-pyramidal structures. Three species are admitted, and it may be that two have developed independently, as one is found in deep water in the Adelaidean region, while two occur in the Peronian region. They are easily separated by means of the external sculpture:—

Anterior radials numerous, finely nodulose *particolor*.
 few, scarcely nodulose *carnosa*.
 few, composed of distant, broad nodules *verconis*.

MUCROSQUAMA CARNOSA.

(Plate xix., figs. 17, 36. Plate xx., fig. 11.)

Chiton carnosus Angas, P.Z.S., 1867, 222, ex Carpenter M.S. in synonymy of

Chiton muricatus A. Adams. Port Jackson, N.S.W. Type in Brit. Mus.

Chiton limans id., ib.

Chiton muricatus A. Adams, P.Z.S., 1852, 91, pl. xvi., f. 6. Sydney, N.S.W.

Type in Brit. Mus. Not *C. muricatus* Tilesius, Mem. Acad. Sci. St. Petersburg, 1824, 483.

Chiton limans Pilsbry, Man. Conch., xiv., 1892, 176. Ex Carpenter M.S. description. Port Jackson, N.S.W. Type in Brit. Mus.

Chiton aurantius id., ib.

Chiton carnosus id., ib.

Chiton limans Sykes, Proc. Mal. Soc., ii., 1896, 93. New name for *Chiton muricatus* A. Adams. Sydney.

Rhyssoplax jacksonensis Ashby, Proc. Roy. Soc. Vic., xxxiii., 1921, 153, pl. viii., f. 1 a, b. Port Jackson, N.S.W. Type in coll. Ashby.

Rhyssoplax carnosus Hull, Aust. Zool., iii., 1923, 164.

Shell medium, oval, elevated, carinate. Colour very variable. Generally brown or olive-green, frequently red, orange, vermilion, yellow or purple, or a combination of two or more of these colours; valve ii. often white or with a white line along the anterior margin.

Anterior valve very elevated, apex erect, sculptured with sixteen faintly nodulose ridges with deep wide interstices.

Median valves with lateral areas well raised with two main ridges, a couple intercalating, obscurely nodulose; interstices smooth; pleural areas with fifteen narrow parallel ridges on each side; small triangular smooth jugal area.

Posterior valve with mucro ante-median; postmucronal slope a little concave; postmucronal area with about sixteen semi-nodulose ribs; ante-mucronal area as central areas.

Girdle covered with closely imbricating striate scales which develop attenuate points with age, more prominent medially.

Interior pinkish-white, darker in middle. Slitting 8—1—12.

Dimensions: 30 x 18 mm. (Shellharbour, figured).

Station: Under stones below low water mark.

Habitat: New South Wales.

MUCROSQUAMA PARTICOLOR.

(Plate xix., figs. 13-16, 38.)

Rhyssoplax particolor Hull, Aust. Zool., iii., 1923, 165, pl. xxvi., f. 5-8. Caloundra, Queensland. Type in Australian Museum.

Shell small, recalling a small *carnosa* but differing slightly in the sculpture of the median areas, notable in that of the anterior valve and lateral areas, less pronounced in the postmucronal area: girdle scales pointed, not so mucronate.

Colour variable. Lilac-rose, mottled with darker; some median valves partly yellowish; the girdle lilac-rose, with four yellow bands in opposing pairs at the sutures of the anterior and posterior valves respectively (type). Other examples are olive-green with white stripe on valve ii., brown and white mottled. Yellow with valves iii. to v. black, and many other variants.

Anterior valve with about twenty-five seminodulose radials reaching little more than half the distance from the girdle to the apex, the apical portion unsculptured.

Median valves with the lateral areas similarly sculptured, two to four radials: pleural areas show about a dozen longitudinal ridges, of which eight cross the valve, jugal area smooth, wedge-shaped.

Posterior valve with mucro median, postmucronal slope a little concave, postmucronal area rayed as anterior valve: ante-mucronal area as central areas.

Girdle scales pointed, larger in the middle, where they become mucronate, but not with such apical points as in *carnosa*.

Interior pinkish white. Slitting 8—1—12.

Dimensions: 13 x 7 mm. (type); 20 x 11 mm. (figured shell).

Station: Under stones below low water mark.

Habitat: South Queensland.

MUCROSQUAMA VERCONIS.

(Plate xix., fig. 6. Plate xx., fig. 8.)

Chiton verconis Torr & Ashby, Trans. Roy. Soc. S. Aust., xxii., 1898, 215, pl. vi., f. 1. Gulf St. Vincent, South Australia (dredged). Type in coll. Torr.

Shell medium, oval, elevated, carinate.

Colour pink, splashed and blotched with cream and a few small patches of brown.

Anterior valve with ten radial rows of separated broad nodules, six nodules to a row, thus forming six concentric rows, apex smooth.

Median valve with the lateral areas formed by two similar elevated rows, narrow depression between, and again six nodules to a row: pleural areas sculptured with about a dozen slanting fine ridges, on each side, the jugal area smooth, narrow linear.

Posterior valve with mucro ante-median, postmucronal slope concave; postmucronal area as anterior valve, but nodules smaller and more closely packed; ante-mucronal area as central areas.

Girdle scales small, mucronate, strongly striate.

Interior pinkish white. Slitting 8—1—12.

Dimensions: 24 x 12 mm. (type).

Station: Dredged.

Habitat: South Australia.

EXPLANATION OF PLATES.

Plate xviii.

- Fig. 1. *Poneroplax costata* Blainville, whole shell.
 2. *Poneroplax albida* Blainville, whole shell.
 3. *Poneroplax paeteliana* Thiele, whole shell.
 4. *Poneroplax paeteliana* Thiele, anterior valve.
 5. *Poneroplax paeteliana* Thiele, median valve.
 6. *Poneroplax paeteliana* Thiele, posterior valve.
 7. *Poneroplax paeteliana* Thiele, interior of posterior valve.
 8. *Poneroplax albida* Blainville, half median valve.
 9. *Poneroplax costata* Blainville, half median valve.
 10. *Poneroplax costata* Blainville, anterior valve.
 11. *Poneroplax albida* Blainville, anterior valve.
 12. *Poneroplax paeteliana* Thiele, half median valve.
 13. *Aerilamma primordia* Hull, whole shell.
 14. *Aerilamma primordia* Hull, anterior valve.
 15. *Aerilamma primordia* Hull, half median valve.
 16. *Aerilamma primordia* Hull, posterior valve.
 17. *Aerilamma primordia* Hull, interior of posterior valve.
 18. *Rhyssoplax torriana* Hedley & Hull, posterior valve from side.
 19. *Rhyssoplax coxi* Pilsbry, posterior valve from side.
 20. *Rhyssoplax jugosa* Gould, posterior valve from side.
 21. *Delicatoplax translucens* Hedley & Hull, whole shell.
 22. *Delicatoplax translucens* Hedley & Hull, interior of anterior valve.
 23. *Delicatoplax translucens* Hedley & Hull, half median valve.
 24. *Delicatoplax translucens* Hedley & Hull, interior of posterior valve.
 25. *Delicatoplax translucens*, Hedley & Hull, scales of girdle.
 26. *Tegulaplax matthewsi* Iredale & Hull, whole shell.
 27. *Tegulaplax matthewsi* Iredale & Hull, scales of girdle.
 28. *Rhyssoplax torriana* Hedley & Hull, interior of anterior valve.
 29. *Rhyssoplax torriana* Hedley & Hull, interior of half median valve.
 30. *Rhyssoplax torriana* Hedley & Hull, interior of posterior valve.
 31. *Rhyssoplax orukta* Maughan, whole shell.
 32. *Rhyssoplax coxi* Pilsbry, whole shell.
 33. *Rhyssoplax coxi* Pilsbry, scales of girdle.
 34. *Rhyssoplax coxi* Pilsbry, half median valve.
 35. *Rhyssoplax torriana* Hedley & Hull, whole shell.
 36. *Rhyssoplax torriana* Hedley & Hull, half median valve.
 37. *Rhyssoplax jugosa* Gould, scales of girdle.
 38. *Rhyssoplax jugosa* Gould, half median valve.
 39. *Rhyssoplax diaphora* Iredale & May, half median valve.

Plate xix.

- Fig. 1. *Rhyssoplax diaphora* Iredale & Hull, whole shell.
 2. *Rhyssoplax calliozona* Pilsbry, half median valve.
 3. *Rhyssoplax exoptanda* Bednall, half median valve.
 4. *Rhyssoplax geraldtonensis* Ashby, whole shell.
 5. *Rhyssoplax tricostalis* Pilsbry, half median valve.
 6. *Mucrosquama verconis* Torr & Ashby, half median valve.
 7. *Rhyssoplax bednalli* Pilsbry, whole shell.
 8. *Rhyssoplax vauchlusensis* Hedley & Hull, whole shell.
 9. *Rhyssoplax vauchlusensis* Hedley & Hull, anterior valve, immature.
 10. *Rhyssoplax vauchlusensis* Hedley & Hull, half median valve, immature.

11. *Rhyssoplax vaclusensis* Hedley & Hull, posterior valve, immature.
12. *Rhyssoplax vaclusensis* Hedley & Hull, scales of girdle.
13. *Mucrosquama particolor* Hull, anterior valve, immature.
14. *Mucrosquama particolor* Hull, half median valve, immature.
15. *Mucrosquama particolor* Hull, posterior valve, immature.
16. *Mucrosquama particolor* Hull, scales of girdle.
17. *Mucrosquama carnosa* Angas, scales of girdle.
18. *Rhyssoplax bednalli* Pilsbry, scales of girdle.
19. *Rhyssoplax bednalli* Pilsbry, anterior valve.
20. *Rhyssoplax bednalli* Pilsbry, half median valve.
21. *Rhyssoplax bednalli* Pilsbry, posterior valve.
22. *Rhyssoplax excellens* Iredale & Hull, scales of girdle.
23. *Rhyssoplax surrecta* Hull, scales of girdle.
24. *Rhyssoplax surrecta* Hull, anterior valve.
25. *Rhyssoplax surrecta* Hull, half median valve.
26. *Rhyssoplax surrecta* Hull, posterior valve.
27. *Rhyssoplax excellens* Iredale & Hull, whole shell.
28. *Rhyssoplax venusta* Hull, anterior valve, immature.
29. *Rhyssoplax venusta* Hull, half median valve, immature.
30. *Rhyssoplax venusta* Hull, posterior valve, immature.
31. *Rhyssoplax venusta* Hull, scales of girdle.
32. *Rhyssoplax venusta* Hull, anterior valve of juvenile.
33. *Rhyssoplax venusta* Hull, half median valve of juvenile.
34. *Rhyssoplax venusta* Hull, posterior valve of juvenile.
35. *Rhyssoplax venusta* Hull, scales of girdle of juvenile.
36. *Mucrosquama carnosa* Angas, whole shell.
37. *Rhyssoplax venusta* Hull, whole shell, adult.
38. *Mucrosquama particolor* Hull, whole shell, adult.
39. *Rhyssoplax vaclusensis* Hedley & Hull, half median valve, adult.
40. *Rhyssoplax excellens* Iredale & Hull, half median valve.

Plate xx.

- Fig. 1. *Rhyssoplax torriana* Hedley & Hull.
2. *Rhyssoplax orukta* Maughan.
 3. *Rhyssoplax coxi* Pilsbry.
 4. *Rhyssoplax jugosa* Gould.
 5. *Rhyssoplax surrecta* Hull.
 6. *Rhyssoplax bednalli* Pilsbry.
 7. *Rhyssoplax vaclusensis* Hedley and Hull (type).
 8. *Mucrosquama verconis* Torr & Ashby.
 9. *Rhyssoplax tricostalis* Pilsbry (var. *aureomaculata*).
 10. *Rhyssoplax tricostalis* Pilsbry.
 11. *Mucrosquama carnosa* Angas.
 12. *Rhyssoplax vaclusensis* Hedley & Hull (juvenile of Queensland form).
 13. *Rhyssoplax calliozona* Pilsbry.
 14. *Rhyssoplax exoptanda* Bednall.
 15. *Delicatoplax translucens* Hedley & Hull.